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The Effects of a Social Stimulus on the Protestant Ethic Effect in Rats

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THE EFFECTS OF A SOCIAL STIMULUS ON THE PROTESTANT ETHIC EFFECT IN RATS

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THE EFFECTS OF A SOCIAL STIMULUS ON THE

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THE EFFECTS OF A SOCIAL STIMULUS ON THE PROTESTANT ETHIC EFFECT IN RATS

Gary L Cotton May, 1975 48 pages

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The purpose of this experiment was to determine whether rats' preference to freeload (eat food pellets from a food cup) or to work for food (obtain food pellets by bar pressing) could be influenced by observing either a working or freeloading model in an adjacent operant chamber.

Following equal amounts of bar press and freeloading training, 18 male Sprague-Dawley rats approximately 100 days old were divided into three experimental groups. The first group was permitted to view a working model while being presented a choice between bar pressing and freeloading. A second experimental group was exposed to a freeloading model while also being presented a choice between bar pressing and freeloading. A control group was permitted to make a choice between working and freeloading with no model present. Two measures of the dependent variable were taken: the ratio of the amount of food earned by bar pressing to the total amount of food consumed and the number of food pellets obtained by bar pressing.

The results of the study indicated that across 5 testing days, there was a trend for the three groups to perform as expected. The group exposed to the freeloading models earned only about one-third of its total food consumption while preferring to freeload the remainder. The group exposed to the working models preferred to earn more than half of its total food consumption via bar pressing. The total amount of food earned by the control group, predictably, fell between the amounts earned by the other two groups. The results are interpreted in terms of social facilitation.

Chapter 1

Review of the Literature

The tendency of organisms to prefer to work for food in the presence of free food has been demonstrated repeatedly over the past decade (Jensen, 1963; Neuringer, 1969; Carder & Berkowitz, 1970; Singh, 1970; Carder, 1972). Such findings seem to be in direct conflict with the least-effort hypothesis proposed by Hull (1943). According to Hull, an organism would be likely to prefer that alternative which lead most easily to goal attainment, provided the habit strength of both alternatives were equal. Due to the inability of Hull's hypothesis to explain the Protestant Ethic Effect (PEE), and because of the controversy which has resulted regarding the possible existence of a need-to-work ethic in humans (Singh, 1972), much research has been generated attempting to explain why organisms might prefer the most difficult method of obtaining food.

Generally, the animal studies concerned with the PEE allow the subject a choice between performing some operant response such as bar pressing (working) and simply eating food pellets from a food dish (freeloading). While all the studies have some form of this choice situation in common, several different types of variables have been

investigated. One variable which has received considerable attention has been the habit strength of both the working and freeloading responses prior to a testing period. Jensen (1963), for example, varied the habit strength of the working response by allowing different amounts of bar press training prior to a choice period. In the choice situation following the training, the rats were then given their freedom to either eat free food available in a food dish or to obtain food by bar pressing. The results of the study indicated that a definite preference to earn food by bar pressing existed. It was also noted that only one of the 200 subjects tested by Jensen ate 100% of its food pellets from the free food dish. In addition, the percentage of food pellets earned by bar pressing was found to increase as a function of the habit strength of the bar pressing response established in training prior to a choice period. Jensen explained these results in terms of the intrinsic appeal or satisfaction that the rats received for earning the food rather than eating it freely from the food dish.

In a study conducted by Leung, Jensen, and Tapley (1968), a procedure similar that that used by Jensen (1963) was employed with the independent variable being the habit strength of the working response. In this case, however, the most difficult method of obtaining food was running a maze rather than pressing a bar for food. In prechoice training, rats received differing numbers of trial runs in

a maze, with each successful run being rewarded by the presentation of a single food pellet. These training sessions were then followed by testing in a choice situation in which the rats had to run over a pile of food pellets in order to reach the single food pellet at the end of the maze. The results of the investigation were found to be in conflict with the previous findings of Jensen (1963). Leung et al. found that the rats who had received the greatest number of prechoice trial runs were less likely to continue running the entire length of the maze (ignoring the pile of food pellets) than were those rats who had experienced only a few prechoice trial runs. The authors noted that the operant responses of maze running and bar pressing should not be considered identical alternatives. It was hypothesized that bar pressing in a Skinner box was more challenging and amusing for the rats than was maze running. Thus, the authors believed that this was why intrinsic appeal was less influential in this experiment than it was in the one conducted by Jensen (1963).

The manipulation of the number of rewarded trial runs of the length of a runway was the means by which Stolz and Lott (1964) also tested the effects of varying the habit strength of the most difficult method of obtaining food on choice testing behavior. These authors gave four groups of rats different numbers of trial runs in a runway prior to a testing situation in which a pile of food pellets was

placed midway between the start box and the goal box. The results of the study indicated that the subjects who had received training in running the length of the alley prior to testing were more likely to pass over the food pile placed in mid-alley on the way to the goal box than were those that received no such training. Similarly, a fixed tendency was found for the rats with previous training to ignore the pile of pellets placed in the alley longer than a group with no training even when the one pellet in the goal box was consistently removed. The authors concluded that these results were due to the fact that training increased the tendency of the animals to traverse the entire length of the alley in order to obtain food.

While all of the above studies have attempted to vary the habit strength of performing the most difficult response to goal attainment, Tarte and Snyder (1973) carried out several experiments to determine the effects of varying the strength of the habit to respond for food as well as the strength of the habit to eat it freely. In the first part of the experiment, rats were given three daily 1-hour sessions as training to eat food freely provided in a metal dish on the floor of an operant chamber. Following the free food training, the animals then received six daily 1-hour sessions to practice pressing a bar for food. When later exposed to a testing situation in which the animals could choose between working and freeloading, it was found

that all but one animal showed strong tendenices to earn the food by bar pressing. A later part of the same study consisted of an attempt by the authors to equate the amounts of time spent by the animals in both free food and bar press training. Tarte and Snyder noted that when this was accomplished, the animals preferred to eat the free food. In a final part of the study, an attempt was made to make the number of pellets obtained by eating free food prior to testing equal to the number of pellets earned in the prechoice bar press training sessions. When bar press training and free food training were thus equalized, the preference of the animals to eat the food freely available was again observed.

Another variable which has been investigated in an effort to explain the PEE is the length of food deprivation. Testing both rats and pigeons, Neuringer (1969) showed that both species would respond for food when free food was available even when they had not been deprived of food. In the first part of the experiment, two pigeons were deprived of food and taught to peck a disk in order to receive grain to eat. Such training was continued for 7 days and then a free food cup was filled with grain in order to offer the birds the chance to make a choice. In the choice situation, Neuringer found that both pigeons continued pecking for food; and only in a situation in which the birds could see the grain but not eat it, did pecking responses decline

drastically. Rats were tested in a similar manner. Each rat was taught to press for food and then allowed to live in the operant chamber for 15 days while each response produced a pellet. Again, both subjects preferred bar pressing to freeloading and only when bar pressing failed to produce food pellets did responding frequency drop. Neuringer explained these results by emphasizing that animals engaged in behavior not necessarily dependent on some biological drive.

The effects of differing lengths of food deprivation on the PEE was thoroughly investigated in a study conducted by Tarte and Snyder (1972). The authors varied the lengths of food deprivation of the animal subjects from 0 to 92 hours. When later placed in a choice situation, it was clearly shown that the animals not deprived of food responded by bar pressing much less often than those animals deprived of food for 24 hours or longer. While the authors found deprivation to be related in some functional way to the preference for bar pressing in the presence of free food, the variables influencing the relationship were not specified.

While all of the studies examined have offered the animal subjects a choice between working or freeloading in order to obtain solid food reinforcers, Carder (1972) added yet another variable by changing the type of

reinforcer available in the choice situation. Stating that rats have a tendency to manipulate their food, Carder hypothesized that since the consummatory pattern of rats for water did not involve such manipulation, no preference should be observed when the animals were given the choice to either earn or freeload water reinforcers. The first part of the experiment consisted of training eight rats to press a bar in order to obtain a 10% sucrose solution (a food substance) while deprived of food. A second group of rats was deprived of water and trained to press a bar for water reinforcements. The results of the study indicated as had been predicted that the eight rats given sucrose earned a mean of 83% of their total consumption, while the six rats given water earned a mean of only 26% of their total intake. It was concluded that there was a definite preference in rats to press for sucrose, indicating that the consummatory patterns of the species investigated were important in determining the preference observed in a choice situation. An alternative explanation was also offered which pointed out possible quality differences in the reinforcing properties of sucrose and water. A second part of the experiment tested the effects of the addition of quinine to the sucrose solution upon the preference for bar pressing. The results of this part of the study pointed out that quinine in the solution reduced both the rate of responding for the reinforcer in the training

sessions and the percentage earned in the testing sessions. The explanation of these results offered by Carder was in terms of the initial hypothesis that food reinforcers would be more likely than water to initiate lever pressing behavior in a choice situation.

The relationship between the housing environment of the experimental animals and the PEE was investigated in a study conducted by Tarte, Townsend, and Vernon (1973). In the Tarte et al. study, 18 rats were reared in four different environments: stimulus-enriched, motor-enriched, stimulus-deprived, and a control. The stimulus-enriched environment consisted of a large wooden box which contained a sandpile and several objects (blocks, balls, and plastic toys). The motor-enriched environment consisted of two activity wheels, each having a counter to record the number of revolutions made by the animals in them. Standard control cages partitioned to one half the original size by a piece of fiberboard were used as the stimulus-deprived environments. The control group remained in regular laboratory cages. When tested in a choice situation, it was found that the control group bar pressed for more of their food than any of the other groups. The stimulus-deprived group and the stimulus-enriched group both showed a preference to eat free food. Tarte et al. explained the results in terms of the differences in novelty between the

home environment and the testing situation. The novelty of the testing situation for the enriched group was believed to have been small compared to their enriched living environment and, thus, their exploratory drive was minimal. The authors believed that the difference in novelty between the living environment and the testing situation for the stimulus-deprived animals could have been so great that it actually inhibited their actions.

One final example of the types of variables that have been investigated attempting to explain the PEE is the type of reinforcement schedule used in the choice situation. Carder and Berkowitz (1970) gave rats a choice to either eat food freely available or to earn food on a schedule of reinforcement ranging from continuous to a fixed ratio of one reinforcement for every ten responses. It was found that the rats preferred to press the bar for food as long as the work demands were not too high. A reinforcement of every tenth press produced a strong preference for eating free food. An immediate return to a preference for bar pressing was observed when the reinforcement of every bar press was again introduced.

The type of reinforcement schedule used was also one of several variables manipulated in a study conducted by Singh (1970). In the first part of the experiment, rats were magazine trained in a standard operant chamber. They were then divided into two groups: one to work in a white

chamber, the other to work in a black chamber. While testing and training, rats that worked in the black chamber received free food in the white chamber with the reverse procedure being carried out on those animals who had originally worked in the white chamber. The rate of reinforcement on the freeloading side was determined by the rat's rate of responding on the work side of the apparatus. On the last day of training, half of the animals terminated their training on the no-work side and half terminated on the side in which food pellets were earned. The animals were then tested in a choice situation. The results of the study indicated that each group obtained more food by working. While a trend analysis revealed no significant trend for any group over the testing period, a definite preference of rats to work for food was demonstrated. In a second part of the study, Singh trained rats on a fixed interval schedule [illegible] provided free food at the same time interval on the no-w[illegible] of the apparatus. After testing in a choice situation [illegible] results showed that the preference for work in the first [illegible]rt of the study was not the result of the training and testing procedure nor was the preference for work found to schedule-specific. In the third part of the experiment, freeloading was made more attractive to the rats by allowing them to obtain reinforcement 12.5%, 25%, and 50% faster on the no-work side of the

apparatus. The results of this part of the study showed that only in the condition where reinforcements could be obtained 50% faster did the rats prefer to eat free food. Singh postulated that the observed preference of rats to bar press for food was due to a need to manipulate and control one's environment.

To summarize, the results of the investigations presented dealing with the PEE have shown that several types of variables are important in determining the observed behavior in a choice situation. While variables such as the habit strength of the working and freeloading response, food deprivation, type of reinforcer, type of housing environment, and type of reinforcement schedule have all contributed significantly to understanding the phenomenon, they have by no means exhausted all of the important possibilities. One variable which seems worthy of investigation is the effect of a social stimulus, such as the presence of another animal, on the behavior observed in a choice situation.

A vast number of studies have been reported dealing with the observed effects of the presence of one organism on the behavior of another. According to Simmel, Hoppe, and Milton (1968), however, there seems to much confusion as to what label this effect should be given: "A number of different, but possibly related, areas have been investigated under an even greater number of terms: social

facilitation, imitative behavior, observational learning, allelomimetic behavior, vicarious learning, behavioral contagion, and many more [p. 1]." Considering the presentation of a social stimulus such as another working or freeloading animal in a choice situation as an independent variable, a definition of social facilitation given by Crook (1961) seems applicable. Defining social facilitation as ". . . that phenomenon observed when the performance of an activity by an individual stimulates the immediate [emphasis added] performance of the same activity by its neighbors [p. 135]," Crook emphasized the importance of the immediate (reflexive) coaction of at least two or more organisms in a social situation. Since the coaction of at least two animals would be very important in any investigation of the social aspects of the PEE while the immediacy of the response would not, further use of the term social facilitation will be limited to the following modified version of Crook's definition: that phenomenon observed when the performance of an activity by an individual stimulates the performance of the same activity by its neighbors.

While no studies have attempted to investigate the possibility of the social facilitation of a preference to either work for or to freeload food reinforcements, a study using a rather unique methodology and apparatus design has

shown that lower animals, too, are capable of responding to social stimuli. In a study conducted by Gilbert and Beaton (1967), two rats were placed in opposite sides of an operant chamber. The two sides of the chamber were so designed that each was a mirror image of the other with each side having similar objects for the rats to manipulate. The two sections of the apparatus were divided by a plexiglass partition allowing both animals the ability to observe the other. Rat A, which was placed in the right side of the apparatus, had been trained only to press a bar for reinforcement. Rat B, placed in the left side of the apparatus, had been previously taught a three-stage chain of behaviors (pressing a speaker lever, pulling a trapeze, and then bar pressing) which also led to food reinforcement. The experiment was set up so that the completion of the chain in one side of the box produced the discriminative stimulus for the first response of the chain required in the other side of the box. The authors reported that on the fifth day of 30 minute exposures in the apparatus, rat A, which had been previously trained to emit only the final bar press response, began emitting the three-stage chain of responses that it had observed rat B perform. The authors discussed the results of the investigation in terms of the ability of rats to learn by imitation.

Chapter 2

Statement of the Problem

As stated previously regarding the PEE, the social aspects of a choice feeding situation have been totally ignored. Based on the results of the Gilbert and Beaton study (1967) which indicated that rats are responsive to social stimuli, it is hypothesized that the social facilitation of a preference to either work for or to freeload food can occur. Specifically, it is hypothesized that a social stimulus in the form of either a working model (a rat that obtains all its food by bar pressing) or a freeloading model (a rat that obtains all its food from a free food dish) can affect the feeding preference of subject-observers. It is believed that those rats exposed to working models will earn more of their food by working (bar pressing) than will those rats exposed to freeloading models.

The dependent variable to be measured will be the amount of food earned by each animal by bar pressing. Two measures of this variable will be used: one will be the ratio of the number of pellets earned by bar pressing to the total amount of food consumed (a percentage) and the other will be merely the number of pellets obtained in each session by bar pressing.

Chapter 3

Method

Subjects

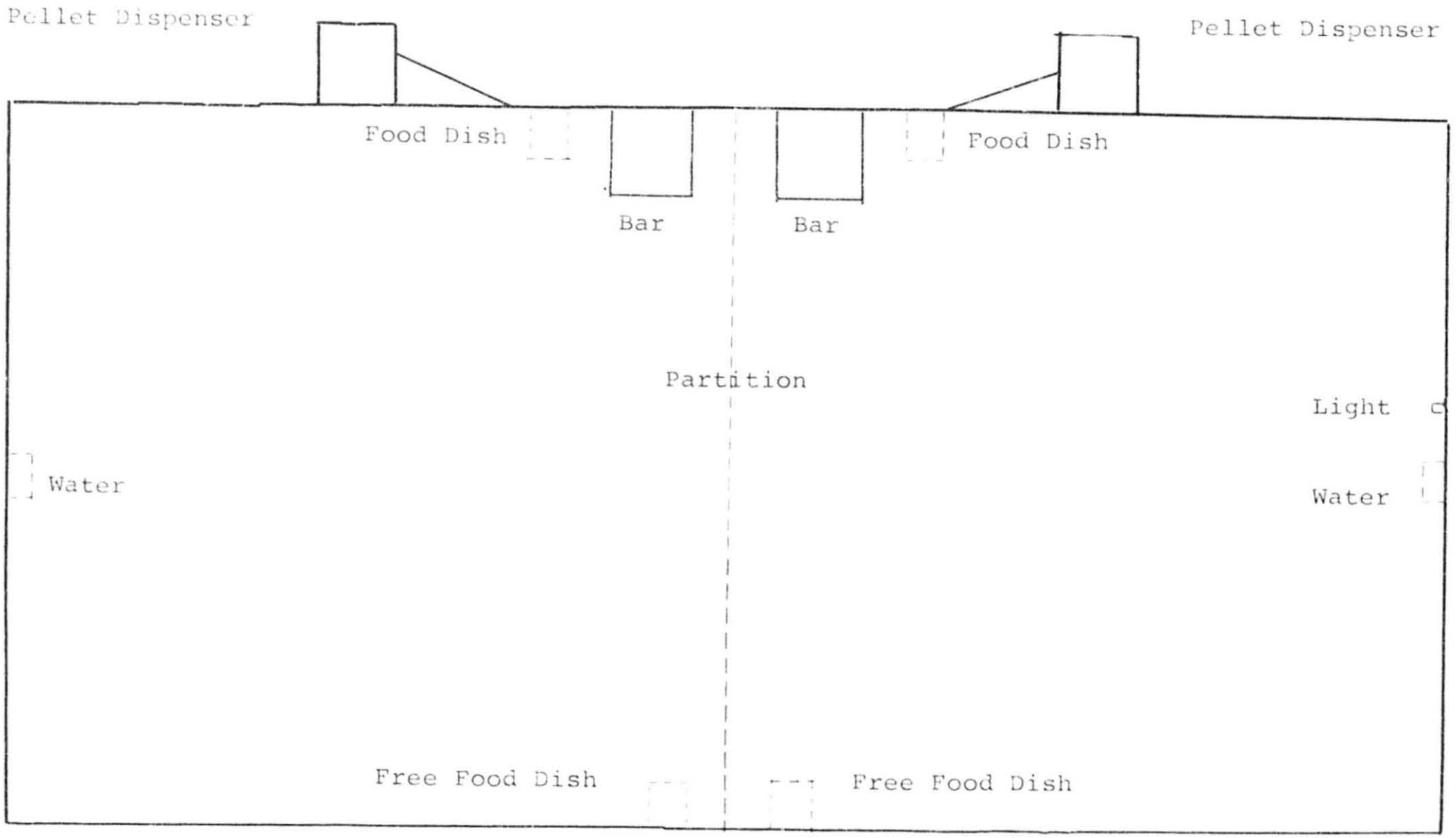
Twenty-four male Sprague-Dawley rats approximately 100 days old were used. All rats were naive and were housed in separate standard-sized laboratory cages throughout the experiment. Of the 24 rats, six were chosen to be models, while the remaining 18 served as subject-observers.

Apparatus

A large chamber constructed of plexiglass and metal was divided in half so that two identical sides resulted. As shown in Figure 1, within each side of the chamber on one wall was a bar which, when pressed, delivered a single 45 mg. Noyes pellet into a food dish. On the opposite wall in each side of the chamber was a free food dish which contained a pile of 225 Noyes pellets during testing. A plexiglass partition, dividing the chamber into two equal sides, made it possible for animals on opposite sides of the chamber to observe each other. The left side of the apparatus always contained the observer rats while models were always placed in the right side. In order to insure that the model was visible to the observer, a small light was placed on the far wall of the right side of the chamber.

FIGURE 1

Apparatus



A continuous level of white noise was maintained in the testing room throughout the experiment. The floor of the apparatus was made of sheet metal which was removed after each testing session and wiped clean with a damp cloth.

Design

A repeated measures design was employed to determine the effects of two independent variables: the type of model to which the rats were exposed and the days of testing. The first variable, type of model, had three levels: a working model, a freeloading model, and no model for the control group. The second variable, testing days, had five levels: each animal was tested under the same conditions on each of five days.

Procedure

A gradual reduction of food intake was accomplished by allowing the animals access to food for 2 hours per day for each of 5 days. Following this, access to food was again decreased to 1 hour per day for each of 5 days. During the 10 day implementation of this 23 hour deprivation schedule, the subjects were also handled daily for 10 minutes. In addition, on the last day of handling, all subjects were allowed to freely explore the apparatus for a 10 minute period.

Following the preliminary measures described above, six animals were chosen to serve as models. Three of these

animals were taught to be workers. These working models were placed daily in the right side of the apparatus after having been shaped and were allowed to earn as many food pellets as they could in a 15 minute period. In each case, the free food dish was empty to insure that they would spend all of their time earning pellets at the bar location. The remaining three animals were used as freeloading models. These animals were also placed daily in the right side of the apparatus and were allowed to eat as many food pellets from the free food dish as they could within a similar 15 minute period. In this case, the freeloading models had not been shaped. As an added measure to insure that the freeloading models obtained their food from the free food dish only, the chance of earning a pellet by an accidental press of the bar was eliminated by disconnecting the pellet dispenser.

The remaining 18 animals served as subject-observers. These animals were divided randomly into two training groups of 9 animals each. In an attempt to equalize the amount of time spent by the animals in free food and bar press training, each group received five daily 15 minute sessions of each. In order to control for an effect due to the type of training which was last given to the animals before testing, one group received the five days of bar press training first, followed by five days of eating from

the free food dish. For the other group, the reverse training sequence was administered. In both cases, a partition was present in the apparatus to make certain that the animals received only the desired type of training. Following each 15 minute session, the animals were given food in their home cages for an additional 45 minutes to maintain their 23 hour food deprivation schedule.

Following acquisition training, three experimental groups were formed by randomly choosing three animals from each of the two training groups. Each group of six animals was then allowed to view one of three types of models: Group W was exposed daily to a working model, Group F was exposed to a freeloading model, and Group C, the control, was placed in the choice situation without models present in the right side of the apparatus. In order to rule out any effect due to the model used, the model-subject pairing was done randomly each day. During testing sessions, the subject-observers were placed in the left side of the apparatus after the model had already been placed in the right side. As stated previously, measures were taken to make sure that the models performed only the desired responses. The subject-observers, however, were free to choose between earning their food pellets by bar pressing (working) and eating food pellets from the free food dish (freeloading). The number of bar press responses made by

the subject-observers was automatically counted while it was necessary to count the food pellets in the free food dish to determine the number that had been consumed. Testing under the same conditions was continued for 5 days.

Chapter 4

Results

An analysis of variance for a repeated measures design was performed on both measures of the dependent variable (the number of food pellets earned by bar pressing and the ratio of the number of food pellets earned by bar pressing to the total number of pellets consumed). As shown in Table 1, the results of the two analyses were quite similar. In both cases, the only significant effect obtained was the day of testing factor, F (4,60) = 7.08 & 5.83, $p < .01$. The effect of the type of model variable in both analyses was not found to be significant, F (2,15) = 1.60 & 2.80, $p > .01$. Graphs of both measures of the dependent variable for each group are presented in Figures 2 and 3. While not significantly different, the data of the three groups do seem to show a trend in support of the initial hypothesis that a preference to work or to freeload can be socially facilitated. The means and variances for each animal over the 5 days of testing were also computed and are found in Appendices A and B. It is evident from these results that a very large within-subject variance existed.

Seven of the 18 animals showed an average preference for earning by bar pressing more than 50% of the total

Table 1

Summary Table of ANOVA

A. Using no. of pellets earned by bar pressing

Source	SS	df	MS	F
A: Type of model	26304.06	2	13152.03	1.60
Ss within	123250.84	15	8216.72	
B: Day of testing	40318.37	4	10079.59	*7.08
A X B	5559.50	8	694.94	<1.00
B X Ss within	85379.33	60	1422.99	
Total	280812.10	89		

B. Using % of pellets earned by bar pressing

Source	SS	df	MS	F
A: Type of model	11083.40	2	5541.70	2.80
Ss within	29959.00	15	1997.30	
B: Day of testing	9472.37	4	2368.10	*5.83
A X B	1375.49	8	171.90	<1.00
B X Ss within	24369.34	60	406.20	
Total	76259.60	89		

* $p < .01$

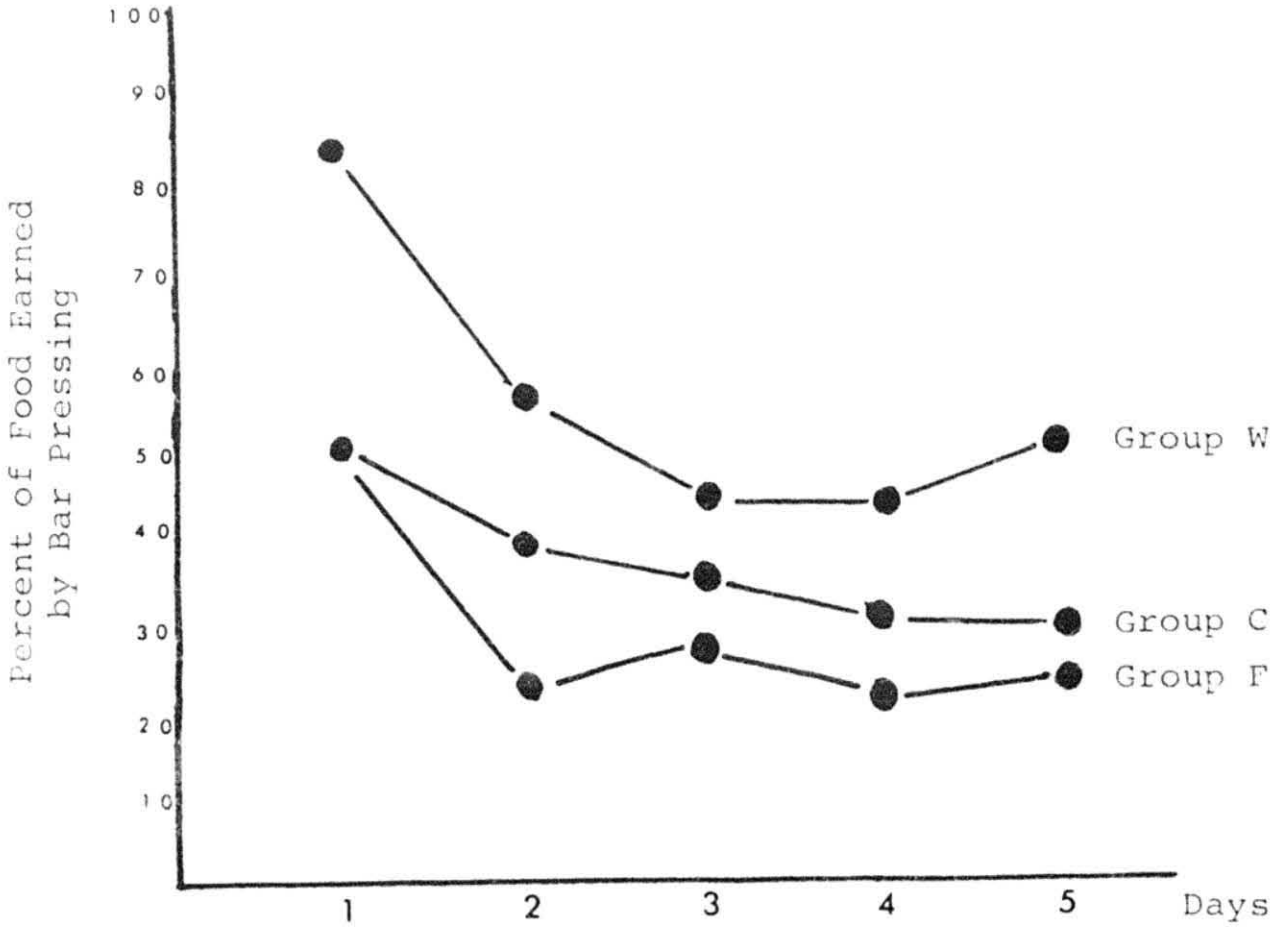


FIGURE 2

Group Data: Percentages

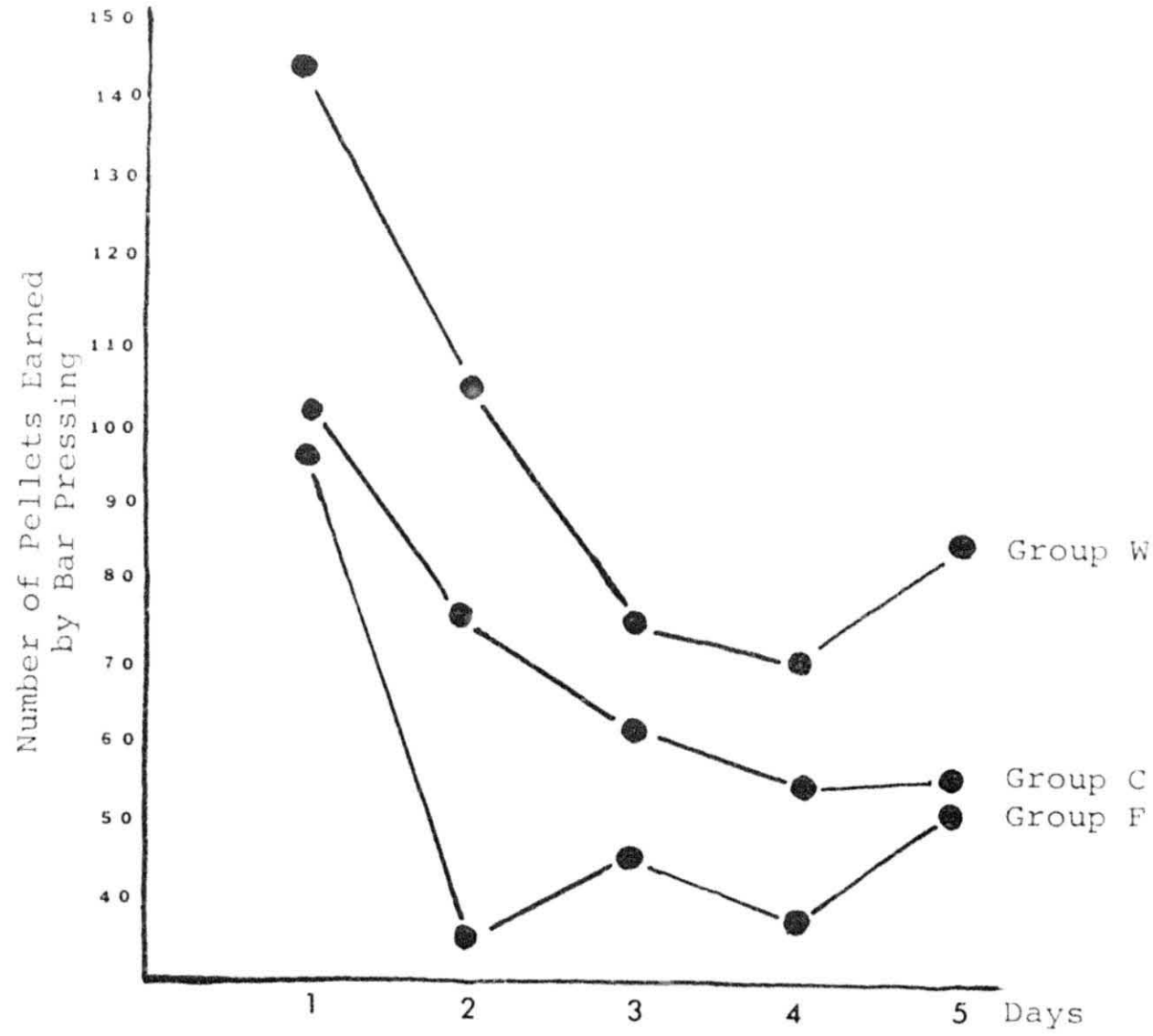


FIGURE 3

Group Data: Number of Bar Presses

amount of food they consumed during 15 minute sessions across the 5 testing days (see Appendix C). It should be noted that of these seven animals, four were members of the group exposed daily to a working model. Three of these four animals were also found to have earned a higher percentage of total food consumption by bar pressing than any animal in any of the other two groups. In terms of the total number of food pellets consumed by each group over the 5 day testing period, it was found that Group F (exposed to a freeloading model) consumed the largest number of food pellets, followed by Group W (exposed to a working model), and then Group C (the control). While the difference between the groups in terms of the total number of pellets consumed was small, it is interesting to look at the total number of pellets earned by working compared to the total number of pellets obtained by freeloading within each group. As shown in Table 2, it is evident that the trend was as expected, e.g. the total number of pellets obtained by bar pressing was greater than the total number obtained by freeloading in Group W while the reverse was true in Group F. The differences in the total number of pellets earned by working compared to the total number of pellets freeloaded were observed to be much smaller in the control group.

The type of training group that the animal was placed in prior to testing was found to be related to subsequent

Table 2

Total Number of Pellets
Consumed by Each Group

Group	No. earned by working	No. freeloaded	Total
W	2878	1663	4541
F	1644	3420	5064
C	2075	2441	4516

behavior in the testing situations. As noted previously, half of the animals (those with even numbers) received 5 days of 15 minute bar press training sessions in the apparatus, followed by 5 days of 15 minute sessions of eating food from the free food dish. For the other half of the animals (those with odd numbers), this procedure was reversed. As can be seen in Figure 4, animals in Groups W and F that ended their acquisition training by bar pressing were found to be more likely to earn a greater percentage of the food they consumed via bar pressing than did those animals in the same group that ended their training by eating food from the free food dish. In the control group, however, this trend seemed to be reversed. That is, the animals that terminated training by bar pressing were more likely to obtain a larger percentage of the food they consumed from the free food dish than were those that ended training with exposure to the free food. Similar trends were seen when the mean number of pellets obtained by bar pressing was used as the dependent measure (see Figure 5).

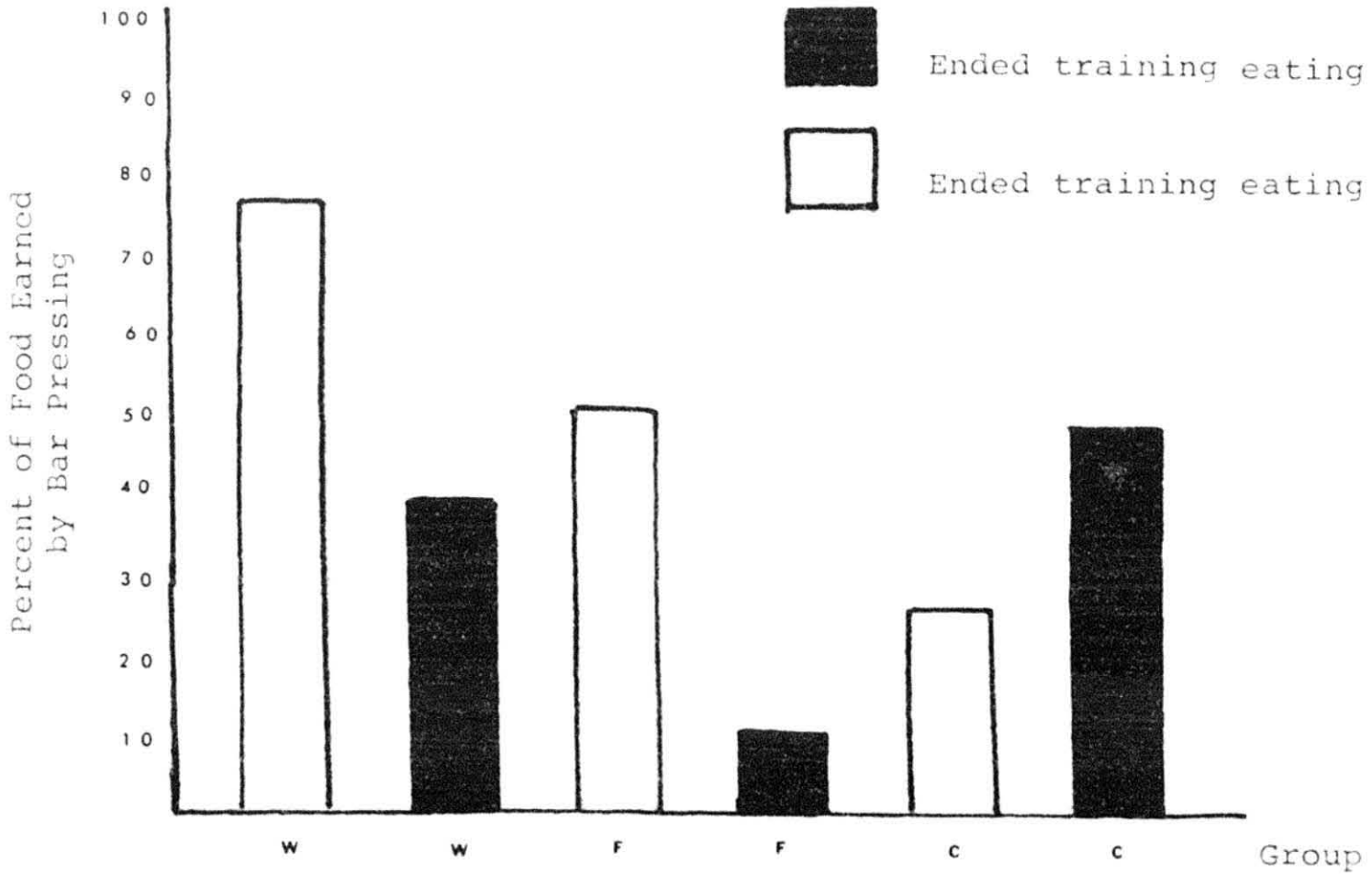


FIGURE 4

Training Group Data: Percentages

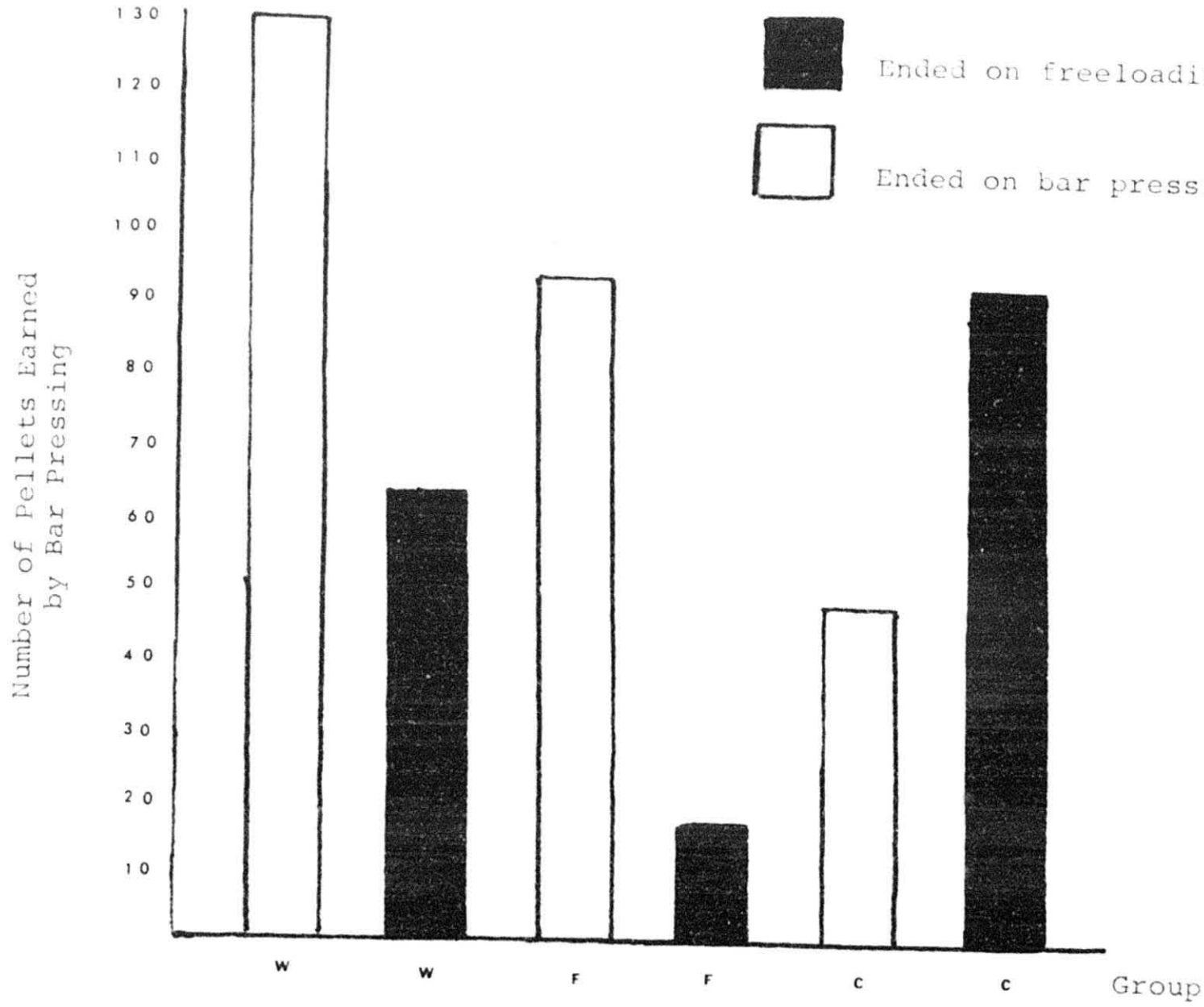


FIGURE 5

Training Group Data: Number of Bar Presses

Chapter 5

Discussion

The significant result obtained for the day of testing factor indicated that the data for the three groups fluctuated greatly over the 5 days of testing. The significance of this factor was not surprising, as only five of the 18 animals maintained the same preference on each testing day. None of these animals was a member of the control group where switches in preference were even more common. These results seem to be in agreement with the results of an investigation of the stability of the preference to work or to freeload over a period of 10 days conducted by Tarte and Snyder (1973). Although not reporting a significant difference between groups over the 10 day period, Tarte and Snyder did report great daily variations in the animals' preferences. The decrease in the preference of the animals to work for food by bar pressing over the 5 testing days was also consistent with the data reported by Taylor (1972) who noted an increased preference for free food over several testing days.

While the type of model factor was not found to be significant, the data do reflect a tendency in support of the initial hypothesis that a preference for working or freeloading can be socially facilitated. Defining social

facilitation as the phenomenon observed when the performance of an activity by an individual stimulates the performance of the same activity by its neighbors, there does seem to be a trend for the animals exposed to a working model to earn more food by bar pressing (e.g., the activity of the model seemed to stimulate the same activity in the subject-observers), and for the animals exposed to a freeloading model to be more likely to obtain food from the free food dish. The control group, predictably, showed a much less distinct preference for either bar pressing or freeloading, as is evident in the slight differences observed between the total number of pellets obtained by working compared to the total number of pellets freeloaded. While the tendencies mentioned are interesting, they suggest little more than a need to replicate and extend the present study.

The finding that the type of training given to the animal in the last part of acquisition seemed to affect the animal's performance on subsequent days of testing points out the need to further investigate this factor. The present findings seem to indicate that studies dealing with the preference of animals in a choice feeding situation need to control for an effect due to the type of training given prior to testing. It would seem essential to equate the habit strengths of both the working and freeloading responses as well as to balance the type of training last given prior to testing by following a training procedure similar to that used in the present study.

Incidential observation of the animals during testing led to the conclusion that the effect of the working model was strengthened by the sound of the model's pellet dispenser. It was noted that when a subject-observer chose to eat food from the free food dish, persistent clicks made by the working model's pellet dispenser often drew the subject-observer away from the free food to the bar location. Subject-observers that preferred to work when exposed to freeloading models were observed to be much less likely to switch locations, indicating that the noiseless presence of a freeloading model in the opposite side of the apparatus was not as effective in initiating a similar activity as was the attention-getting clicks made by the working models. These observations seem to lend some support for a perceptual model of social facilitation as offered by Tolman (1968). For example, it is possible that it was not the social stimulus, per se, that elicited the facilitated response, but rather that the social stimulus served only to attract the subject-observers' attention to a nonsocial stimulus (the click of the pellet dispenser) which then elicited the desired response. It is suggested that another investigation be designed to determine whether this was, indeed, the case. To do so would involve testing the effects of both social and nonsocial stimuli (such as the mere clicking of a pellet dispenser) in a similar choice situation. Such an

investigation would be important not only because it might clarify the findings of the present study, but it might also result in a more definitive conclusion regarding the function of a social stimulus in eliciting a facilitated response.

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Appendix A

Mean and Variance for Each Subject

Over 5 Days of Testing

Using no. of pellets earned by bar pressing			
Group	Animal	Mean	Variance
W	1	142.4	551.04
	2	89.4	1109.84
	3	138.4	588.64
	4	61.6	4003.44
	5	106.2	1074.16
	6	37.6	1566.64
F	7	120.6	1394.64
	8	23.6	1065.84
	9	101.2	3954.56
	10	8.4	173.44
	11	58.6	2115.44
	12	16.4	410.24
C	13	70.0	1022.00
	14	101.4	1304.64
	15	47.4	3778.24
	16	102.4	1245.84
	17	21.8	734.56
	18	68.4	158.24

Appendix B

Mean and Variance for Each Subject

Over 5 Days of Testing

Using % of pellets earned by bar pressing			
Group	Animal	Mean	Variance
W	1	76.2	137.76
	2	50.2	316.56
	3	79.8	78.16
	4	35.2	1226.56
	5	69.4	287.44
	6	26.4	705.84
F	7	56.0	189.20
	8	14.0	384.00
	9	52.8	908.16
	10	7.2	145.36
	11	40.2	400.16
	12	9.2	118.96
C	13	34.6	254.36
	14	48.4	205.44
	15	24.8	922.56
	16	54.4	285.04
	17	17.8	405.76
	18	42.6	79.04

Appendix C

Mean Percentage of Food Pellets

Earned by Bar Pressing

To Total Consumed

Group	Animal	Mean %	Overall Group Mean %
W	1	*76.2	
	2	*50.2	
	3	*79.8	
	4	35.2	
	5	*69.4	
	6	26.4	56.2
F	7	*56.0	
	8	14.0	
	9	*52.8	
	10	7.2	
	11	40.2	
	12	9.2	29.9
C	13	34.6	
	14	48.4	
	15	24.8	
	16	*54.4	
	17	17.8	
	18	42.6	37.1

* denotes those animals that preferred to work for more than half of the food they consumed over 5 days of testing.